

REMARKS

At the outset, applicants would like to thank Examiner Ildebrando for her time and consideration of the present application at the interview of October 14, 2003 with the undersigned attorney. At the interview, the contentions of the outstanding Official Action were discussed.

Claims 27-52 are pending in the present application. Claims 27-39 have been amended to more particularly point out and distinctly claim the present invention. While claims 46-52 have been withdrawn, they also have been amended. Upon allowance of the product claims, applicants respectfully request the rejoinder of claims 40-52.

In the outstanding Official Action, claims 27-29, 31-37, and 39 were rejected under 35 USC §102(b) as allegedly being anticipated by or, in the alternative, under 35 USC §103(a) as allegedly obvious over RICHMOND et al. Applicants believe that the present amendment obviates this amendment.

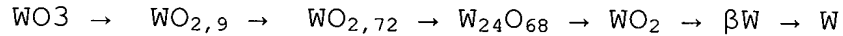
RICHMOND et al. disclose diaryl ethers that are prepared by dehydrating phenols or derivatives of phenol in the presence of a catalyst. The catalyst comprises a composite of partially reduced tungsten oxide on alumina, zirconia, or titania. The composite may be prepared by reduction with

hydrogen at a temperature between 300 and 450°C. A dehydration reaction is then performed at a temperature of 350 to 550°C.

Applicants believe that RICHMOND et al. fail to disclose or suggest the claimed invention. Applicants believe that RICHMOND et al. do not teach or suggest the claimed bifunctional catalyst. Applicants believe that the obtained active phase of RICHMOND et al. cannot be WO_2 . In the case of the Al_2O_3 or ZnO_2 support, it is an intermediate oxide of Wo_x where $2 < x \leq 3$ with an acidic functionality (not bifunctional) using appropriate XPS-UPS surface techniques. The reduction temperature is insufficient. For example, the examples utilize a temperature of 350°C. In this respect, applicants respectfully direct the Examiner's attention to four references (1-4) covering the research in this field from 1973 to 2003. Therefore, in the case of the TiO_2 support, the active phase must also be Wo_x and not WO_2 .

It is impossible to reduce the tungsten W(VI) to W(IV) under the temperatures of only 250-450°C as described in the RICHMOND et al. application. However, the acidic function required for the dehydration of phenol in the case of the RICHMOND et al. document can be accomplished by any of the tungsten suboxides Wo_x where $2 < x \leq 3$ (see e.g., enclosed documents A; B; and Triwahyono et al.).

Indeed, the reduction of WO₃ follows the pathway:



Thus, the RICHMOND et al. publication does not teach a polyvalent bifunctional catalyst as claimed (see present specification at page 1, lines 20-30 and page 3, lines 20-30). Indeed, this feature has not been mentioned or suggested in the publication.

Applicants also believe that the citation of the reduction of W(VI) to W(IV) on page 3, lines 40-45 of this document is of pure speculation and has no scientific foundation. Applicants believe that this is confirmed by the uncertainty of this speculation in the same line. As shown in the works of Chappel et al. and Triwahyono et al., Richmond et al. actually obtained some oxidic W_{o_x} where $2 < x \leq 3$ (there are lower valency states less than 3 such as W₂₀O₅₈ but not until WO₂) with only acidic properties that are sufficient for the dehydration of phenols.

As a result, the RICHMOND et al. publication cannot be considered to anticipate or render obvious the catalyst of the present invention.

Claims 27-29, 31, 37, and 39 were rejected under 35 USC §102(b) as allegedly being anticipated by or, in the alternative, under 35 USC §103(a) allegedly being obvious over YOSHIOKA et al. Applicants believe the present amendment obviates this rejection.

The disclosed catalysts in YOSHIOKA's publication are defined by a titanium oxide + a mineral clay + an additional carrier + a transition metal compound (see abstract or col. 3, lines 21-32; col. 4, lines 31-38). The term "titanium oxide" is defined in col. 3, lines 36-47 and encompasses a variety of different chemical compounds with different properties (titanium dioxide (TiO_2), titanium monoxide (TiO), titanium (III) oxide (Ti_2O_3), ortho and beta titanic acid, and mixtures of these).

The term "non-noble transition metal" is defined in col. 3, lines 33-35 and line 64 - col. 4, line 11. The term includes a large variety of metals, metal oxides or sulfates of selected transition metals of groups: IB, VIB, VB, VIIB and VIII of the periodic table and cerium, i.e., oxides from copper, vanadium, chromium, molybdenum, tungsten, manganese, iron and cerium. The oxidation number of the metal oxide is not restricted in particular and oxides of any oxidation number are feasible (col. 4, lines 4-6).

Thus, an almost unlimited combination is possible. However, none of these two is explicitly disclosed. Moreover, there is no suggestion for such a combination. At best, the inactive $\text{MoO}_3/\text{TiO}_2$ is mentioned in Example 6, Table 1.

Thus, applicants believe that YOSHIOKA et al. do not teach or suggest a catalyst with bifunctional activities (acidic + metallic). It is believed that one of ordinary skill in the

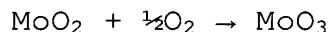
art would lack the motivation and reasonable expectation of success of modifying the teachings of YOSHIOKA et al. to obtain the claimed invention.

Claims 27-28 and 30-38 were rejected under 35 USC §102(b) as allegedly being anticipated by, or in the alternative, under 35 USC §103(a) as allegedly being obvious over MIKI et al. Applicants believe the present amendment obviates this rejection.

MIKI et al. disclose a specific combination comprising not less than 4 active species, namely an iron oxide + a nickel oxide + a vanadium/molybdenum oxide + an alkali metal/alkaline earth metal oxide.

Preferably, the molybdenum oxide is molybdenum trioxide MoO_3 , although it may include molybdenum dioxide MoO_2 (see page 3, line 40 of said document). However, it appears that none of the examples mention the presence of an active dioxide.

The MIKI et al. patent application cannot then disclose the MoO_2 species. This compound is instable in the presence of oxygen and will always be oxidated into the inactive MoO_3 (see page 4, lines 47-55). Applicants believe that this is evidenced by the following reaction:



As a result, the MIKI et al. document cannot disclose a catalyst based on WO_2/TiO_2 or $\text{MoO}_2/\text{TiO}_2$. Moreover, the catalyst of this document may indifferently be supported on titanium oxide or

silica (see page 4, lines 13-14). Thus, it cannot disclose bifunctional properties (metallic + acidic).

Moreover, there are no similarities between the chemical and catalytic properties of the different nickel, iron, vanadium and molybdenum oxides and those of MoO_2 or WO_2 . In fact, the disclosed MIKI et al. combination of oxides cannot perform the isomerization of alkanes. As a result, MIKI et al. cannot teach the claimed bifunctionality nor the deposition of the active WO_2 or MoO_2 on an identified support on which the bifunctionality is maintained.

Thus, applicants believe that one of ordinary skill in the art would lack the motivation and reasonable expectation of success to modify the teachings of MIKI et al. to obtain the claimed invention. Indeed, applicants believe that there is no reason for one of ordinary skill in the art to search for technical knowledge set forth in MIKI et al. when it does not pertain to the chemical reactions to be catalyzed.

Thus, applicants believe that MIKI et al. fail to anticipate or render obvious the claimed invention.

In view of the present amendment and the foregoing remarks, therefore, it is believed that the present application is now in condition for allowance, with claims 27-39, as presented. Allowance and passage to issue on that basis are accordingly respectfully requested.

Application No. 09/786,791
Amdt. Dated December 8, 2003
Reply to Office Action of June 6, 2003
Docket No. 0514-1077

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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APPENDIX:

The Appendix includes the following item(s):

- P. Biloen and G.T. Pott, J. Catal., 30 (1973) 169-174.
- P. Tittarelli, A. Iannibello and P.L. Villa, J. Solid State Chemistry, 37 (1981) 95-102.
- P.J.C. Chappel, M.H. Kibel and B.G. Baker, J. Catal. 110 (1988) 139-149.
- S. Triwahyono, T. Yamada and H. Hattori, Appl. Catal. A. 250(2003) 75-81.
- Document A: Fig. 10 of W. Schubert, Int.J. Refract.Hards Metals 9(4)(1990) 178
- Document B: Fig. Out of J. Booth, T.Elström, E. Iguchi and R. Tilley, J. Solid State Chem., 41 (1982) 293.